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# THE JOURNAL OF PHILOSOPHY

## PSYCHOLOGY AND SCIENTIFIC METHODS

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### A REVISED CONCEPTION OF CAUSATION AND ITS IMPLICATIONS<sup>1</sup>

TO identify causation with sequence is a matter of established practise. Frequently, however, "change" is given as the more distinctive feature of causation. But the passage from "change" to "sequence" is a short step. For when the question is raised: What constitutes the cause or existence of change? the answer invariably follows: the antecedent (or antecedents) that regularly precedes a change is its cause. Thus Mill may be taken as widely representative when he writes that "whether the cause and its effect be necessarily successive or not, the beginning of a phenomenon is what implies a cause, and causation is the law of succession of phenomena";<sup>2</sup> that is, "the beginning of a phenomenon [change] is what implies a cause," but causation with him, notwithstanding, is a *succession* of phenomena, "whether the cause and its effect be necessarily successive or not." I can not conceive of a passage more full of delicious confusion. But should we, on the other hand, insist that "change" in the form of origination, is not thus adequately explained, then Bradley, following in the spirit of Hume, offers the other common variant on the subject: "We may regard cause as an attempt to account rationally for change. . . . But the endeavor to find a satisfactory reason is fruitless."<sup>3</sup> Thus the history of causation is briefly indicated: Causation is either an invariable sequence or it is purely and simply a matter of skepticism. Kant and his descendents, as we shall see, present no exception to this general position. It is not amazing that philosophy, thus pledged in causation to succession, was led only to an evasive or negative conclusion. Rather is it praiseworthy that, thus pledged to a wrong path, philosophy should frankly proclaim that its analysis of causation led to nothing.

<sup>1</sup> Read before the American Philosophical Association, Philadelphia, December, 1915.

<sup>2</sup> "Logic," page 248; 8th edition.

<sup>3</sup> "Appearance and Reality," page 54.

Closely bound up with causation is the attempt to define or, as is more common, to leave undefined, especially in its objective sense, that exceedingly vague and much-abused term, *relation*. What relations *are*, however, constitutes a specific question. Instead of a definition, a mere affirmation or denial of relations is what we frequently encounter. Often it is the fact of *origin* that is confounded with and substituted for a definition of relations. Without a prior definition of relations, however, their classification as internal and external is equally lacking in pith. In defining causation, I shall in a way also define the meaning and reality, such as it is, of relations. But in so doing I shall not attempt within the limits of this paper to state whether relations have an objective meaning and reality apart from causation.

# I

In a study of causation, two things must from the outset be kept distinct; namely, causation and uniform recurrence. Causation is one thing and uniform recurrence is another, and we merely invite defeat when we substitute recurrence for the foundation of occurrence. Put thus, their usual identification certainly reflects curious confusion. But a mere statement of the confusion does not carry us very far. What it should do is to apprise us of the necessity to define each of them more fully in its own specific nature. Not until then would it seem permissible on our part to add that they are one and the same thing or two different things. Before subscribing to the error, then, that uniform recurrence is causation,<sup>4</sup> I would urge that we first inquire into the nature of each.

For, by way of argument, let us assume that causation has its differentia in the fact of sequence. This characterization, however, soon proves its inadequacy. Nor do we improve matters when, in the course of time, we prefix "invariable" to sequence. For the problem that would return is, how to differentiate this form of an invariable sequence from other possible forms of it. Thus time, for example, in its divisions of past, present, and future, involves a sequence no less invariable than that asserted of causation.<sup>5</sup> Causal sequence, therefore, must involve something more or something different from what it shares in common with other forms of an invariable sequence to justify its status as a distinct phase of human ex-

<sup>4</sup> How Mill in particular makes all the facts in his extended analysis of causation fit into this formula is interesting reading.

<sup>5</sup> In this connection, I beg the reader to recall Mill's defense of causation as an invariable sequence against "the objection," as he writes, "very plausibly urged by Dr. Reid, namely, that according to this doctrine night must be the cause of day, and day the cause of night; since these phenomena have invariably succeeded one another from the beginning of the world." "Logic," page 244.

perience. Can we give evidence of this something more or different? Thus pressed, suppose we fall back upon the element of change. But if causation be identified with sequence, the change-aspect of causation, as perceived in the statement of Mill, is sublimated into a mere succession of independent, static units. Hume's own position on the subject is a commonplace: "every effect is distinct from its cause. It could not, therefore, be discovered in the cause." Not to appear niggardly, however, let us admit the element of change. But even with the element of change incorporated, would causation as an invariable sequence differ from, let us again say, time? They would not differ from each other in so far as we affirmed that change in time, as denoted by the terms past, present, and future, was of the same general order as change in causation, denoted by the terms cause and effect. But if we do not establish a difference between them in point of "change" or "succession," we of necessity fail as yet to differentiate causation from time, or time from causation. Yet forthwith to identify them is not justifiable, although at this point such procedure is common; for in the event of their identification, we ought to guard against the use of two terms, apparently so different, for one and the same thing. If, however, in the belief that causation is something distinct, we push our analysis a little further, we would soon see that "change" in causation differs from that of time in three fundamental respects. In the first place, change is not only central to causation, but it is *empirically* determinable, whereas the reality of an actual change in time is rather, like time itself, an inferential existence based upon the reality of some accepted form of an empirical change. Hence, in causation, it is the idea of discontinuity that comes to the front; in "time," it is the idea of continuity. Secondly, a causal change is *empirically conditionable*, whereas a change in time is neither empirical nor empirically conditionable. By the phrase "empirically conditionable," I mean that every specific instance of causation either is, or in the postulate of every science is assumed to be, under the control of a specific number of specific objects<sup>6</sup> (or things) to the exclusion of others. Thirdly, causation is often reversible, whereas time, for all we know of it, is not reversible. Thus, for example, chemists affirm that every chemical compound is of the reversible type; that is, the effect of a cause may in turn become the cause of the original cause. The fact that *every* instance of causation is not convertible does not affect the conclusion that many instances of causation are convertible, whereas time *never* is. Now convertibility emphatically proves that causation

<sup>6</sup> I use the word "object" in its loose and general meaning. The problems it involves for causation may, for the present, be entirely discounted.

may work backward as well as forward. In a consideration of convertibility, then, we have to take note of a distinction that is not only radical in its bearing upon any conception of causation itself, but one that is in high degree directly destructive of that wide but erroneous tendency to unite or identify causation with time. Causation is thus distinguished from time by the fact that the former embraces, as essentially vital to it, certain characteristics totally lacking in the latter. Our decisions were attained, however, by abandoning the element of sequence in causation for that of change. The question as to whether sequence is at all relevant to causation will return for discussion under several different forms. Generalizing, we reach the conclusion that a causal situation is distinguished from a non-causal one by the mere presence or absence in a given situation of an empirically determinable change. Holding to the fact, then, that every empirically determinable change is an instance of causation, we may add that some of its additional characteristics are that it is empirically conditionable and often reversible. Other characteristics of causation will be made evident in the course of the discussion. Here, however, we may affirm that a causal occurrence is thus obviously identifiable, and, of necessity, will remain so whether the occurrence is regular or capricious. The fact of a regular or capricious recurrence under similar conditions, would be a second distinct fact. Hence it will fall within the province of this paper, a little later on, to show that regular recurrence, in its aspect of regularity, is an event as distinct and unique in human experience as that of occurrence. Accordingly the question as to whether occurrences regularly repeat themselves constitutes one problem. The question as to the foundation of an occurrence constitutes another. We may answer the first question in one way or another; but the problem of occurrence would not be at all affected by the conclusions reached in respect to recurrence. First, then, let us direct attention to the subject of occurrence.

## II

A "cause" in the full meaning of the word is not only an object that precedes an event, called an effect, but it is further assumed to be something from which the effect itself issues forth. Our failure to lay bare the particular principle of our search is to be ascribed to our neglect adequately to analyze a "cause." To begin with, a "cause" never consists of *one* object only, nor, on the other hand, does it consist of *all* existing objects. A limited number of objects represents in every case the specific cause of a specific effect. If this were not true, a change would in large measure forfeit its conditional and empirical character. For in the statement that a given

change is conditioned, the fact of an agency is less frequently implied than the inclusion of certain objects to the exclusion of others. That, out of a vast multitude of objects, we select a specific number of them as the elements of a cause, is a commonplace in logic. The reason we offer is that the origination of an event, however inscrutable, is, notwithstanding, entirely within the control of the specific objects involved. But this so-called inscrutable element should, as I shall take pains to prove, be pushed back two additional steps. Thus, let us accept *A*, *B*, and *C* as the cause of *E*, their effect. By including *A*, *B*, and *C* in the cause we merely invoke a principle that in its turn excludes *D*, *F*, and *G* as elements within this specific cause. Such instruction is the burden of logical methods. But an additional bit of information remains to be added; namely, that *A*, *B*, and *C* may exist without producing the "effect" *E*. Wherein, then, lies the difference between these two manifestations of *A*, *B*, and *C*? My answer is brief. The difference lies in what I shall term for the present the principle of interaction. Moreover, it should be noted that the interaction is between the elements constituting the cause and not between the cause *and* the effect. Thus relevancy plus interaction yields the result, but relevancy minus interaction, or irrelevancy by itself, does not. The cause of an occurrence, therefore, primarily draws attention to *the elements* of a cause. Even then, however, we satisfy the demands of one problem only when we turn to hydrogen, oxygen, and the electric spark as the relevant objects of the effect "water." Two additional problems would demand explanation; the problem of relevancy *versus* irrelevancy, and the problem of interaction *versus* non-interaction.

When our interest is in "what" combined with "what" is the cause of another particularized "what," sequence may suffice as a methodological description of causation, because causation is empirically conditionable and because causation is regular, or is assumed to be regular, in the mode of its behavior. But to direct attention to a bare correlation of "whats," and by so doing to draw attention *from* the facts of occurrence and relevancy—however valid this may be in the pursuit of certain problems—ceases to be valid when the result of the analysis is offered in conjunction with regular occurrence as an *adequate* analysis of causation. The play "Hamlet" with the prince left out would offer less in the way of caricature. For let us ask the simple question: Will *A* and *B* taken together be followed by *C*? Suppose, for the sake of the argument, we answer in the affirmative. Next, let us ask if *C* is different from either *A* or *B*? Suppose, overlooking certain difficulties, we again answer in the affirmative. Here, then, we have the factor of "change" in the form of an origination. As an aspect of experience it is as clearly

distinguishable as any other. Hence, it not only needs explanation, but it would persist in demanding explanation, whether it occurred *with* variation in the history of the universe or whether it recurred *without* variation. For the present, the history of thought is sufficient evidence that, ignored or overlooked, origination does with no ending return to plague us. The fact of origination granted, the statement I now advance is that in seeking its cause, we meet a problem of the same general order as would confront us in seeking the cause of such events as sound or motion.<sup>7</sup>

But to this mode of approach tradition might seem to close the door. Thus, I might be asked: Does not this very reference of an effect to a cause, in an inquiry directed to an empirical proof of its objective reality, imply a prior faith in the existence of the very thing under discussion? In the demand itself, it might be said, are you not acting in response to a principle, subjective or *a priori*, that compromises the whole problem at issue? But this type of objection, I rejoin, confuses two very distinct things. It confuses the problem involved in a possible *connection* of an effect with a cause (which may be either subjective or objective in its foundation), with the problem involved in the bare *cause* of an empirical origination. In fact, if cause and effect have a *connection*, it may be that the "cause" of an empirical origination yields the most unquestioned principle in its support. Thus Hume, by the help of *custom*, established one kind of linkage between them; but the principle made evident in the second inquiry may itself function to correct custom. And if, upon Kantian ground, we affirm a pure thought-basis for the linkage, the degree of dependence in thought upon a like empirical basis would remain an open question; and to the extent of a *dependence* in thought, give evidence of an existing *independent* order. In fact, it is in view of the issue here created, that I now make the specific claim that causation, conceived as a sequence, not only compromises the special question at issue in causation (Kant being the most striking failure), but that causation, thus conceived, never comes to the possession of a foundation that is not in some form or other purely subjective or thought-made. Tradition, taken in plain facts, has enforced little else. The mistake of tradition lies, therefore, not in its *analysis* of causation as sequence, but, rather, in the *identification* of causation with sequence. As a correction thereof, I would, in the first place, identify causation with an empirically determinable and an empirically conditionable type of

<sup>7</sup> My aim, to be sure, is not to unravel all the mystery thus naturally embraced, but to push it back, as I said, two steps—steps of a radical significance for metaphysics. See two other articles of mine in this JOURNAL; Vol. XI., page 655, and Vol. XIII., page 253.

phenomenon; and, in the second place, still more narrowly identify causation with the cause of an "origination," which like sound or motion may be viewed as existing in specific instances or as a specifically generalized type of phenomenon.

I term "origination," then, a specific type of thing, just as I would term sound or motion a specific type of thing, without entering upon the discussion, here irrelevant, how or by what process of thought we come to the acceptance of this or any other of the variety of distinctions commonly affirmed in human experience. By the term "origination" I imply merely the partial or complete *extinction* of *A*, *B*, and *C*, in their *formation* of *E*, as, for example, the extinction of hydrogen and oxygen in their formation of water. However far we push our analysis, we shall continue to find sufficient mystery. The fact remains, nevertheless, that the passage of hydrogen and oxygen into water is a passage so radical in form as to give rise and shape to an aspect of experience as distinct as that of motion or sound. Accepting extinction and origination, then, as facts, I would raise the question: What constitutes their cause? And to this question I venture the answer: the cause lies in the *interaction* of its relevant elements, with the emphasis now, not upon relevancy, but upon the principle of *interaction*. I shall consider the matter of relevancy more fully a little later.

The difference in the capacity of an object in one situation or in a number of them *to act*, and in another situation or series of them *not to act* upon other specific objects is, as a general characteristic of objects, a distinct fact of experience. The fact that interaction may, from the standpoint of a sensuous cognition, be inferential in its status, in no way invalidates the fact that a given object, *A*, is inert in respect to *B* and *C*, but active or effective in respect to *D* and *E*. Thus viewed, change is a mere sign or index of (1) the existence and (2) the characterization of interaction. (1) As a sign of its existence, an effect or change constitutes merely an objective (and not a purposive or subjective) principle in the determination of relevancy *versus* irrelevancy;<sup>8</sup> and (2) an effect or change characterizes the interaction existing between the relevant objects of a cause as of this or that *kind*; namely, physical, chemical, psychical, moral, or whatnot. Hence, we may abstract this property in objects—of interaction or non-interaction—and not concern ourselves

<sup>8</sup> Note, please, that the interaction (hence the relation or connection) is not between the effect *and* the cause, but between the objects, which, taken together to the exclusion of other objects, constitute the "cause." "We do not proceed in causation from a 'relation' to 'change,' but we proceed from a 'change' to the claim that such objects as involve a change indicate a dependence or connection—a relation—which neutral objects, by comparison, are seen to lack." I quote from an earlier article of mine in this JOURNAL, Vol. XI., pages 658-663.

further with the specific *kind* of interaction or non-interaction involved. It is in this generic sense, therefore, that I would reserve the term "interaction" as *the foundation of bare occurrence*. But when, turning our attention from the bare cause of an occurrence, which the generic term "interaction" adequately supplies, we inquire into the cause of a particularized occurrence, as, for example, the cause of iridescence, then the more generic term "interaction" ceases to meet the demand. In the latter case our problem consists no longer in ascertaining the mere ground for occurrence, but, rather in determining "what" is combined with "what" in the *accepted* occurrence of another particularized "what." An assurance in the existence of interaction is as inevitable as the recognized difference between merely "relevant whats" and "relevant whats plus change in one or more of them." Our location of this principle in the relevant objects rather than elsewhere or nowhere is equally inevitable. To take a simple demonstration, consider hydrogen and oxygen as jointly isolated; and then, solely by a variation in their temperature, either have them initiate their extinction in the formation of water or have them fail to do so. Repeat the process to and fro and with or without the result as often as you like. Then if you still remain loath to ascribe the "cause" of these differences—to produce and not to produce the result—to a *difference* in the capacity of objects to act or not to act (especially when all other objects have been rigidly excluded), where may the "cause" be located? The question needs only to be stated to reveal the absurdity of any other answer than the one offered.

But to affirm that interaction is as much an ultimate characteristic of a given group of objects as non-interaction, brings us, in metaphysics, in collision with much that, in Berkeley and Hume, has grown to be traditional. As opposed to Berkeley and Hume, chemistry, for reasons that I shall set forth in connection with relevancy *versus* irrelevancy, has no scruples in substituting the term "properties" for the term "qualities" in the identification of objects. What we find in Berkeley and Hume is a half-truth expressed dogmatically. They affirm, strongly enough, non-interaction or disconnections in the existence of objects, but they also most emphatically deny interaction or connection. Thus Berkeley ceaselessly reiterates that objects are inert; that they have in them nothing of action, activity, or agency. "All events," as Hume writes, "seem entirely loose and separate. . . . They seem conjoined, but never connected." In meeting this position, I advance the statement that both connection and disconnection, or, if we prefer, interaction and non-interaction, are relative to the existence of a change. Hence, deny the reality of change, and you deny the reality of both, and that of

causation as well. Affirm the reality of change, and you have your sole basis for affirming the reality of any one of them. As such, they are equally ultimate, equally relative, and all of them alike, directly unobservable. *Per se* the terms connection, disconnection, and relation have no reality. All we have are objects either reciprocally effective as based upon an accepted empirical evidence of change, or reciprocally inert as based upon an *accepted absence* of an empirical change. Causation and non-causation, therefore, in the sense of bare occurrence, have their foundation in part at least in the two fundamental matter-of-fact aspects—to act and not to act—that any specific object may have in changing degree and variety with other objects.

We may conclude, therefore, that objects as a matter-of-fact experience interact, and fail to interact; and that different objects behave differently in this respect toward other objects. Objects, therefore, in their mutual dependence as well as in their mutual independence imply the existence of objective differences. Relevancy *versus* irrelevancy, no less than interaction *versus* non-interaction, has its foundation, then, in differences in objects that are purely objective. For that objects operate thus differently in respect to each other is an indubitable fact. But that such differences are also incapable of a reduction to a sensuous equivalent is equally indubitable. Objects, therefore, in their mutual dependence and in their mutual independence (for the same object may be dependent in respect to certain objects and independent in respect to others) represent a range of *mutual determination that is independent of any psychophysical agency*. The main business of chemistry is the tabulation of such differences in the mutual behavior of objects. It is instructive to note that mere symbols are sufficient for it in the organization of its data. The reason for this is that a chemist is primarily interested, not in the differences that may be bound up with the direct and isolated identification of objects, but rather in that sphere of differences *incident to objects in their mutual operations*. The operation or absence of operation disclosed in connection with the objects of its inquiry is accepted by the chemist as a fact of ultimate experience; hence, we must stand equally ready to accept *differences in objects* that are ultimate and objective (non-sensuous). The implication of their existence is as inevitable as the claims of chemistry to the standing of a science. But it must not be overlooked that ultimate and objective differences are present in the reciprocal behavior of complex objects as clearly as in the reciprocal behavior of such more elementary objects as chemistry presents.<sup>9</sup> Thus the complex things,

<sup>9</sup> For a fuller elaboration of this issue, see this JOURNAL, Vol. XI., pages 603-607; Vol. XIII., pages 253-256.

water, sugar, and lemon-juice, in respect to lemonade, are equally ultimate in their unique capacities to function one way rather than another—differences in objects that are independent of and inaccessible to a sensuous cognition. The *results* of their reciprocal actions, notwithstanding, prove them to be ultimate, different, and real. The emancipation of epistemology from the leading-strings of psychology offers a tempting next-step in the way of an exposition.<sup>10</sup> In the interest of the more immediate problem, causation, I merely mention the implication for epistemology, and pass on.

In an analysis of causation, I find that several distinctions must be kept carefully in mind. These distinctions are best drawn forth by the aid of a simple concrete case of causation. The variations of one instance of it from others are not vital. Let us, therefore, consider the case of iron magnetized by the aid of electricity. First we have the iron and the electricity in their mutual independence; then we have them in their interaction, in which state magnetism, although clearly dependent for its existence upon the interaction, nevertheless acquires a status as independent as iron and electricity prior to their interaction. Now in our ordinary way of dealing with the matter in metaphysics, we term the iron and the electricity the cause, magnetism the effect, and the process, a sequence. To affirm or deny a tie or a relation between cause and effect is the next step commonly adopted. But this ordinary procedure is easily shown to be an error. To begin with, it is not valid to speak of iron and electricity in their mutual independence as the cause. They do not exist as a "cause" until their interaction. But the interaction no sooner exists than the effect or some effect is also present. Now to speak of a cause as the foundation of an effect is misleading, if we fail, as we commonly do, to distinguish between iron and electricity in their mutual independence, and iron and electricity in their interaction. In their mutual independence, they constitute no cause at all in the real sense of the word; and in their interaction, they are no longer mere cause, but also effect. How, then, out of this situation can we extract a meaning for the term "sequence"?

For answer, I turn to Kant. He summarizes the foundation of causation in a brief passage. "It follows, first of all," he writes, "that I can not invert the order, and place that which happens before that on which it follows; secondly, that whenever the antecedent state is there, the other event must follow inevitably and necessarily. Thus it happens that there arises an order among our

<sup>10</sup> Such an exposition would involve a proof to the effect that an individual is "neutral" as well as "effective" in the determination of reality. I have attempted this specific proof in Vol. XIII., pages 259-265 of this JOURNAL.

representations in which the present state points to an antecedent state . . . and connects that event with itself by necessity, in the succession of time,<sup>11</sup> . . . as the condition of the synthetical unity of phenomena in time."<sup>12</sup> This passage, easily recognized as typical in Kant's struggle to make an *a priori* element of thought the foundation of an objective causation, resolves itself into three parts. In the first place, he states that causation is a non-reversible order. Now there is a sense in which causation does embody a non-reversible order; namely, the effect, magnetism, follows and does not precede the so-called cause, iron and electricity; but to the extent in which causation, as stated, is reversible, Kant's statement is lacking in truth. Moreover, the causal order is not an order, as Kant would affirm, that of itself determines objects; rather is it an order of things, as has been pointed out, that is determined by objects. The proof of this is found in the fact, as already indicated, that an object may exist and have nothing follow it. Hence, when Kant claims, in the second place, "that whenever the antecedent state is there, the other event must follow inevitably and necessarily," he states what is absolutely untrue of a non-causal situation and also of iron and electricity prior to their interaction; for in neither case does anything follow. And if, in another situation of relevant objects, something does happen (I avoid the word follow), then Kant begs the very thing at issue when he fails, as he does, to discriminate, and to give the ground for discrimination, between the very different situations involved, and presented in our illustration. In the light of such omission it is not surprising that Kant remains unable to tell why in one case we call a given object an antecedent, in another, a consequent, and in a third, neither an antecedent nor a consequent.

The third part of Kant's argument introduces the subject of *connection* in causation. He holds that in the succession of time the present state of necessity points to and connects itself with an antecedent state. The connection he seeks to establish is a connection in sequence. The connection involved in the interaction of the relevant elements of a cause is ignored. Yet the only basis that Kant, in the last analysis, offers in support of a *connection in sequence* is the need in thought, if you will, to unify a succession in time. He fails, in the first place, to perceive that "time" in itself offers no differentia of causation, since "time" is as much involved in the synthesis of a non-causal as of a causal situation. And, in the second place, he fails to note the rôle of *interaction*, without which, however, his units (as illustrated) are iron, electricity, and magnetism in

<sup>11</sup> "Critique of Pure Reason," Muller's translation, page 162.

<sup>12</sup> *Ibid.*, page 160.

their mutual independence. Hume's formulation of the identical situation, therefore, is more within truth when he writes "that one event follows another, but we never can observe any tie between them"; for, as with Kant, not only is the intervening fact of an interaction overlooked, but the connection is sought for *in sequence and not between the multiple objects constituting the cause*. For the foundation of a sequence, however, Hume offers custom. Now it is true that "custom" or a "synthetic unity in the succession of time" may yield a basis for a distinct type of sequence. But since a given effect, magnetism, can not be associated at random with any object or objects, but, by the principle of causal relevancy, is to be associated with certain objects only, then a principle must be admitted to exist which is not only independent of custom, but which, within certain limits, is itself invoked either to correct or determine custom. And the same thing may be said of Kant's "synthesis." For if it were true, as he affirms, that causal sequence has its foundation in "the synthetical unity of phenomena in time," how would he explain the existence of error incurred when a wrong group of objects is embraced in the origin of a certain result? The objective order, thus clearly intimated, is entirely ignored. Neither Hume nor Kant, therefore, has attained a foundation for causal sequence in any sense of the word commonly demanded. But suppose we, on our own account, now raise the question as to whether an objective connection exists between magnetism *and* iron and electricity. To this we may reply that in their mutual independence no *objective* connection can be said to exist between them; and that in their interaction, the *connection* is obviously between iron *and* electricity and not between magnetism *and* iron and electricity. I am contending for a metaphysical fact, not for the foundation of a methodological aim.

Turning to chemistry, we meet with what seems a more plausible ground for connection in sequence. Thus a chemist speaks of water as  $H_2O$  for the reason of its origin from and its possible resolution back into  $H_2O$  without any loss of weight throughout the process. Hence for him water and  $H_2O$ , as indicated by the formula, are one and the same thing. But by thus denying to water a distinctive reality the chemist logically denies the reality of change, and, thus naturally, that of causation as well. For he does not have *three* things, water, hydrogen, and oxygen, but only hydrogen and oxygen. There is no need for enlarging upon the point. The illustration serves in a striking way to prove that the principle of identity can not yield an *objective* basis for a causal sequence between two things, when, as may be perceived, this principle, pushed with the

rigor of an absolutist, first reduces the two things to one.<sup>13</sup> Hume, adopting the other extreme, affirmed that cause and effect were fundamentally different. But whether cause and effect are wholly alike or wholly different, or partly alike or partly different, the foundation for a connection between cause and effect would, in any case, be *subjective*, even though the grounds upon which either may ultimately come to repose would embrace principles more or less objective. And among so-called objective principles, interaction and its correlative non-interaction among specific objects are preeminent. The particular *result* bound up with objects in interaction is another fact; and its regular or irregular occurrence is a third fact. As such, the two latter involve the element of *necessity*, not an *objective connection* or *relation* in any clear sense of the words. The term, relation, demands the existence of an empirical change within a limited group of objects; the *existence* and the *kind* of relation are not otherwise recognizable or definable except by reference to a specific *kind* of change.

### III

I turn from causation to uniform recurrence. The fact of interaction, I admit, approximates in its nature that of an inference. Uniform recurrence, on the contrary, approximates in its nature matter-of-fact reality, and, as such, it is directly observable and capable of demonstration. Referring again to chemistry as one science among others, we find uniform recurrence exemplified in the laws of constant proportions and constant weights. In fact, a large sphere of its activity is given to determine, within its own province, whether nature really does act with a more or less fixed regularity; and, in so far as the chemist can thus discover uniformity or constancy in occurrence, the basis for a science *versus* mere history is established.

But to this Hume might be thought to reply: What is gained by all this nicety in present determination of recurrence in a world that involves a future as well? Every future judgment, he would go on to say, involves faith in a *continued* constancy; it does not involve merely the fact of a past and present constancy. I admit this objection, but I do not admit it without certain obvious reservations that Hume overlooked. In the first place, if we must face the future with nothing but the past to stand upon, we must not forget that that past itself at one time involved a future, in the course of which the faith in nature's regularity would pragmatically come to displace the opposite faith. But this reservation only scratches the problem. A fact of far deeper significance appears in the Humian

<sup>13</sup> It represents Bradley's mode of approach and criticism of causation.

claim that knowledge ceases when uniform recurrence ceases. But the fact is, that only one *kind* of knowledge would cease—the type of knowledge based upon recurrence as ultimate. But a knowledge of nature—and this can not be denied—would still be a knowledge of nature even if history, under the changed and changing conditions, were the only kind of knowledge that nature made accessible. Thought and purpose may be constitutive, but an objective causation and an objective recurrence are constitutive of knowledge in a more ultimate and superior degree. Hence, whatever the form in which occurrence and recurrence are found to exist, together they represent the objective order of things and a standard of truth. I can not, however, enter here upon further discussion of the matter.<sup>14</sup>

Hume's arguments on uniformity preserve their negative validity only where, in the first place, we confuse recurrence *as the basis of a universal predication*, with recurrence *as a matter-of-fact experience*; secondly, where knowledge, such as it is, is discredited or ignored in the extended organization and basis it actually possesses through the conservation in knowledge of a vast identical past with the augmentations of the present; thirdly, where the possibility of a changed state in recurrence is unduly exaggerated into a high order of probability; and, lastly, but most important of all, where, as is still maintained in many quarters, uniformity is held to as inaccessible to proof, for the reason that thought in its proof of recurrence must itself rely upon the truth of the very thing at issue. But no argument can be made to inveigh against recurrence that does not apply to knowledge in any other form whatsoever. A general distrust in the reliability of thought to deliver truth is out of place, therefore, when mixed up with the fact of recurrence as something special and peculiar to it. Uniform recurrence, where employed in the guise of a postulate, lies wholly within the control of its matter-of-fact experience. It is derived from and not prior to that experience. Hence, its future use will be a problem in probability, which the future matter-of-fact experience, however, will convert into either fact or error.

An incorrect conception of causation is in large measure responsible for the many one-sided "isms" that have dominated philosophy. I offer the revised conception of causation without appending the "isms" that I recognize as rooted in it.

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<sup>14</sup> I have given this matter fuller discussion in several publications under the title of relativity.